



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,969	07/31/2003	David L. O'Meara	071469-0303535	1846

909 7590 07/21/2006

PILLSBURY WINTHROP SHAW PITTMAN, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER

LE, DUNG ANH

ART UNIT PAPER NUMBER

2818

DATE MAILED: 07/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/630,969	O'MEARA ET AL.	
	Examiner	Art Unit	
	DUNG A. LE	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 5/11/2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 17-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 17-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

De

DETAILED ACTION

This is a new ground of rejection based on newly applied reference(s).

Claim Rejections

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 17, 18- 20, 23- 25, 28- 31 are rejected under 35 USC 102 (b) as being anticipated by Buchanan et al. (6,245,616 B1).

Buchanan et al. teach a method of forming a semiconductor microstructure, the method comprising:

positioning a substrate 12 containing an initial dielectric layer 22 in a process chamber (especially refer to Figs. 2A-2B and related texts and col 7, lines 27-45) ;

flowing a process gas comprising an oxygen-containing gas in the process chamber; and

forming an oxide layer 32 with high thickness uniformity, the oxide layer being formed between the initial dielectric layer and the

substrate in a self-limiting oxidation process, wherein the partial pressure of the oxygen-containing gas in the process chamber is less than about 50 Torr (col. 6, lines 39- 42 and col 7, lines 50-55).

Regarding claim 18, wherein the initial dielectric layer 22 (and related texts) comprises at least one of an oxide layer, an oxynitride layer, an nitride layer, and a high-k layer.

Regarding claim 19, wherein the oxide layer 32 (col 6, line 33) comprises $\text{SiO}_{2.0}$.

Regarding claim 20, wherein oxynitride layer comprises $\text{SiO}_{x}\text{N}_{y}$.

Regarding claim 23, wherein the process chamber pressure is less than about 40 Torr (col 6, lines 40-45).

Regarding claim 24, wherein the oxygen-containing gas comprises $\text{O}_{2.0}$ (col 6, lines 30-35).

Regarding claim 25, wherein the process gas further comprises N.sub.2 (col 6, lines 30-35).

Regarding claim 28, wherein the substrate temperature is between about 500.degree. C. and about 1000.degree. C. (col 6, line 30).

Regarding claim 29, wherein the substrate temperature is about 700.degree. C (col 6, line 30).

Regarding claim 30, wherein the process chamber pressure is less than atmospheric pressure (col 6, line 41).

Regarding claim 31, wherein the process chamber pressure is less than about 50 Torr (col 6, line 41).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention

Art Unit: 2818

was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 21 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Buchanan et al. (6,245,616 B1) in view of Hattangady et al. (6716695).

Buchanan et al. teaches the claimed invention as applied to claims 17-18 except for the nitride layer comprises silicon nitride as cited in current claim 21.

Hattangady et al. teach the nitride layer 18 (figs 1C- 1D and related texts) comprises silicon nitride.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the nitride layer comprises silicon nitride on the oxide layer in Buchanan 's method in order to obtain the best practical device.

Claims 22, 26- 27 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Buchanan et al. (6,245,616 B1) in view of Ballantine et al. (6,444,592).

Regarding claim 22, Buchanan et al. teaches the claimed invention as applied to claimS 17-18 except for the high-k layer comprises at least one of HfO_2 , ZrO_2 , Ta_2O_5 , TiO_2 , Al_2O_3 , and HfSiO as cited in current claim 22.

Ballantine et al. teaches the high-k layer 16 (and related texts) comprises at least one of HfO_2 , ZrO_2 , Ta_2O_5 , TiO_2 , Al_2O_3 , and HfSiO (col 6, lines 15-20).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the high-k layer comprises at least one of HfO_2 , ZrO_2 , Ta_2O_5 , TiO_2 , Al_2O_3 , and HfSiO , because the above mentioned high-k layer is commonly used to prevent undesirable or detrimental reactions in the contact region, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the desired application.

Regarding claims 26-27, Buchanan et al. teaches the claimed invention as applied to claim 17 except for the process gas further comprises an inert gas and wherein the inert gas comprises at least one of Ar, He, Ne, Kr, Xe, and N_2 . as cited in current claims.

Ballantine et al. teaches the process gas comprises an inert gas and wherein the inert gas comprises at least one of Ar, He, Ne, Kr, Xe, and N_2 . (col 5, lines 7-20).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize the process gas comprises an inert gas and wherein the inert gas comprises at least one of Ar, He, Ne, Kr, Xe, and N.sub.2. in Buchanan et al. 's method, in order to improve the diffusion resistance of the oxide layer (col 5, lines 23-27).

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dung A. Le whose telephone number is (571) 272-1784. The examiner can normally be reached on Monday-Tuesday and Thursday 6:00am- 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, M. Smith can be reached on (571) 272-1907. The central fax phone numbers for the organization where this application or proceeding is assigned are (571)272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DUNG A. LE
Primary Examiner
Art Unit 2818